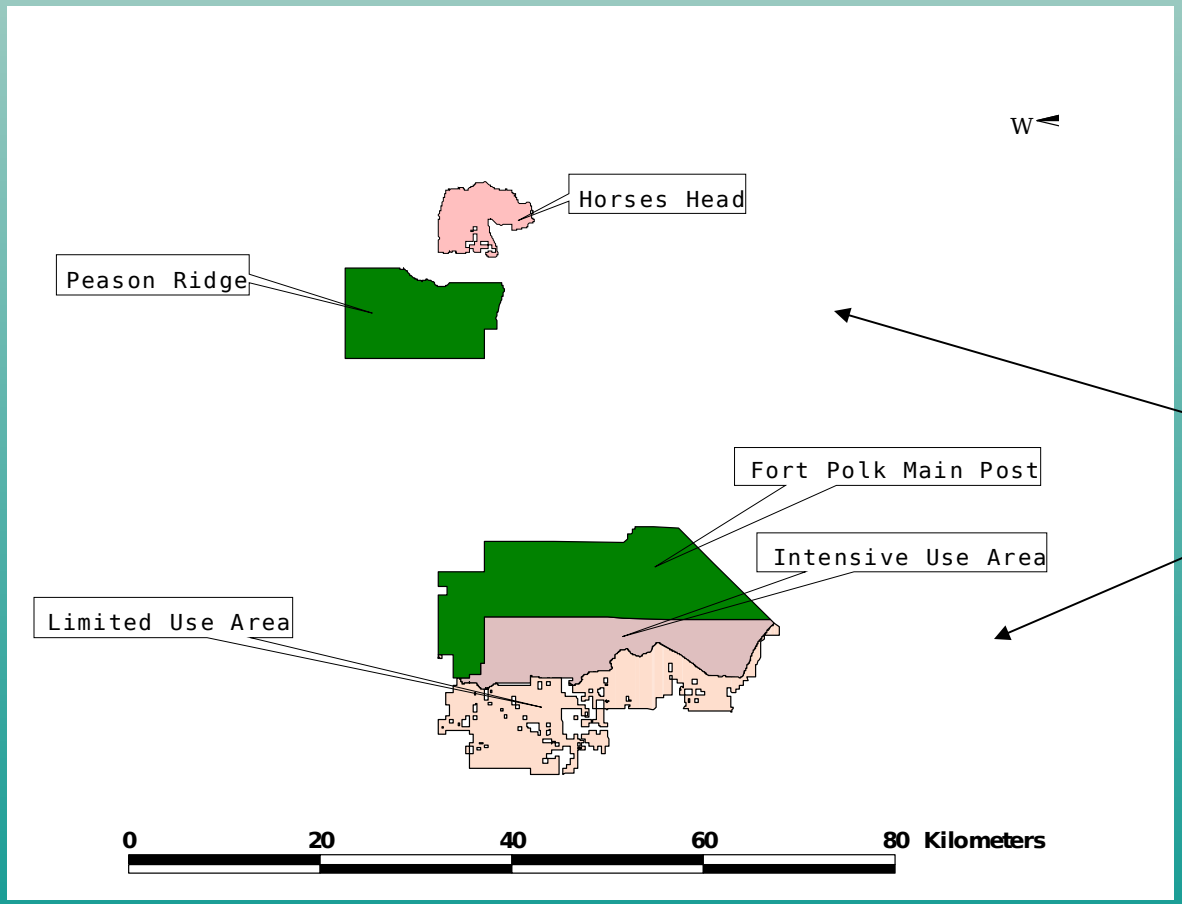
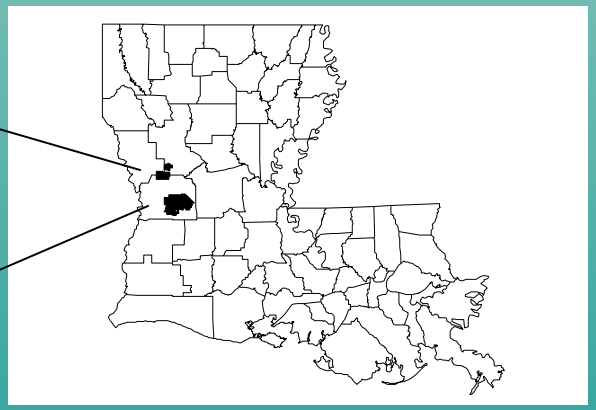
An Integrated Approach To Meet Interagency Management Objectives With LCTA Data

11th Annual ITAM Workshop
19-23 August 2002

R. Wagner and D. Hightower, Quantitative Ecological Services, In
J. Smith and C. Allen, CEMML, Colorado State University, and
C. Stagg, DPW-ENRMD, Fort Polk, LA

Fort Polk Training Lands





Objectives

- Assess baseline vegetative conditions at a landscape scale across Army and Forest Service training lands at Fort Polk
- Measure landscape scale changes in vegetative conditions through time
- Compare baseline vegetative conditions and trends among Federal and non-federal lands
- Develop vegetative cover (C-factor) map for use in determining land conditions
- Support National Environmental Policy Act (NEPA) documentation assessing impacts of military training

LCTA Program

- Total of 250 total LCTA plots established at random locations
- 206 core plots on Main Post, IUA and Peason Ridge
  - Established 1992-1994
  - Sampled on 5-yr rotation
- 44 special use plots on LUA
  - Established 1996-1999
  - Sampled annually

Challenges

- LCTA data found to have limited utility for detecting training effects at Fort Polk
  - Few transects in high intensity training areas
  - LCTA methods weighted towards observations <=2m above the substrate (60% of possible LCTA contacts)
  - Most habitats on Fort Polk and KNF are fire dominated
- LCTA data did not cover all potential training lands

Challenges

- Multi-temporal vegetative cover data layers not available for Federal or non-federal lands
- Existing C-factor layer for ATTACC model was based on course vegetative cover data and unvalidated LCTA data

Development of Vegetative Index

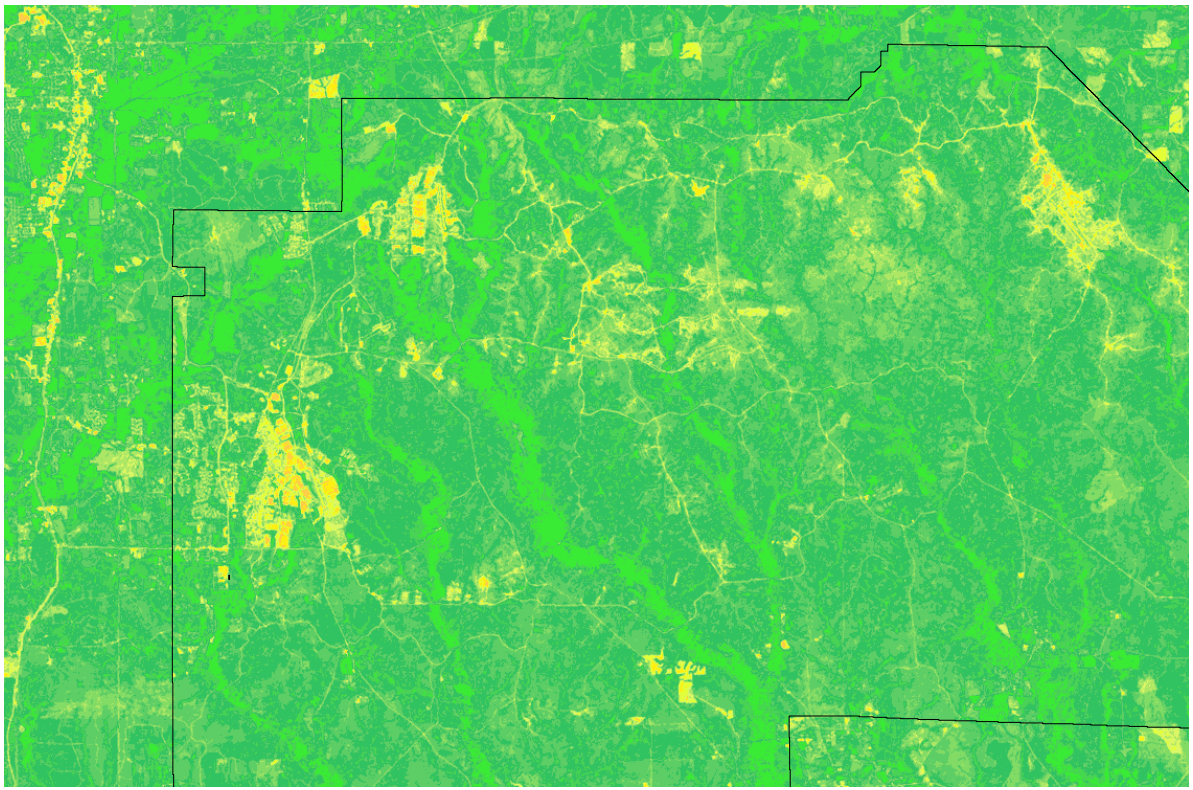
- Tasseled cap function uses all 6 of the non-thermal TM bands to derive indices of brightness, greenness, and wetness
- Greenness represents biomass and thus serves as an index of vegetative cover density and vigor, similar to other better known vegetation indices such as NDVI
- Other vegetative indices use only 2 TM bands
- At-satellite reflectance tasseled cap function was applied to Landsat TM images for Spring/Fall 1992 (TM 5) and Spring/Fall 2000 (TM 7) to derive greenness
- Spring images selected based on Senseman (1996) findings and our observations

Greenness Categories

- Continuous greenness values for each image were generalized into 20 equal intervals to account for variation and facilitate interpretation
- Original greenness intervals were reduced to 12 categories
- Greenness categories were ground-truthed and tested against LCTA data
- Strong correlation found between greenness and current vegetative conditions

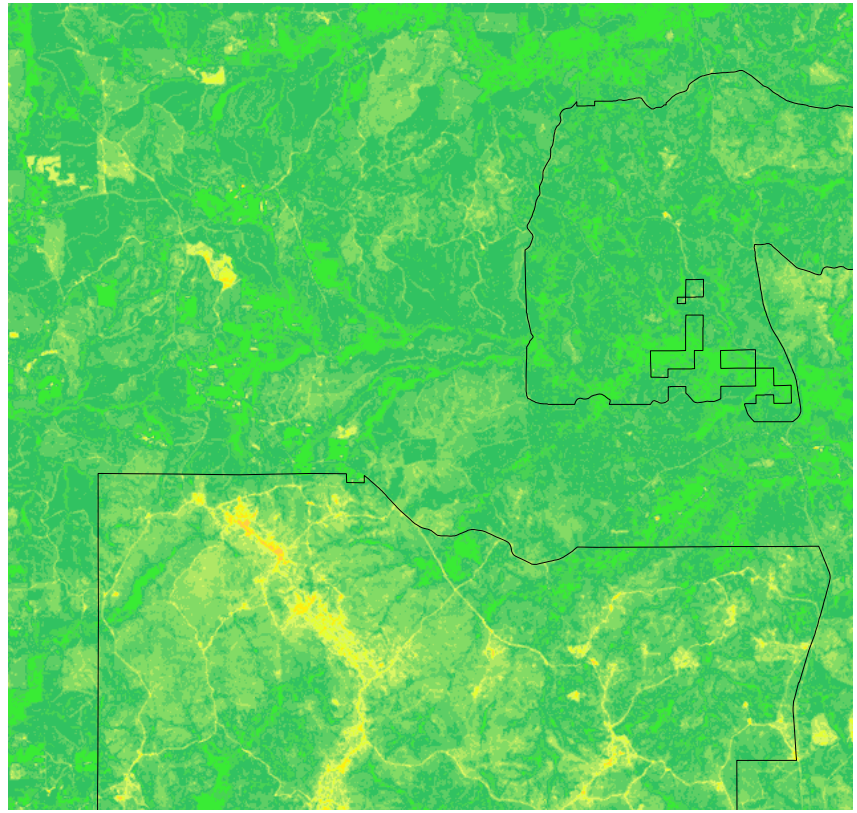
Spring 2000 Greenness

Fort Polk Main Post (Army), IUA and LUA (Forest Service)

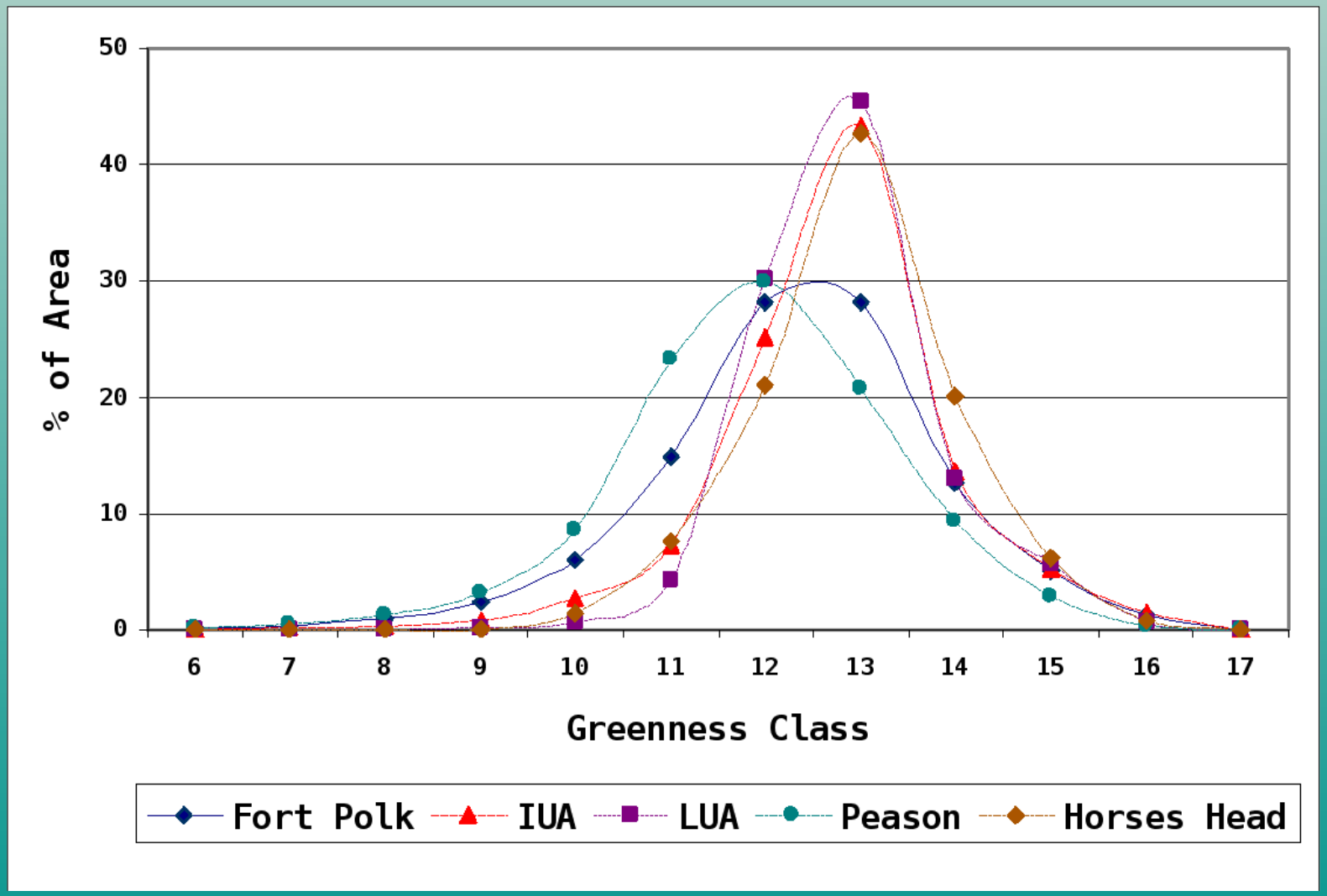


Spring 2000 Greenness

Peason Ridge (Army) and Horse's Head (Forest Service)

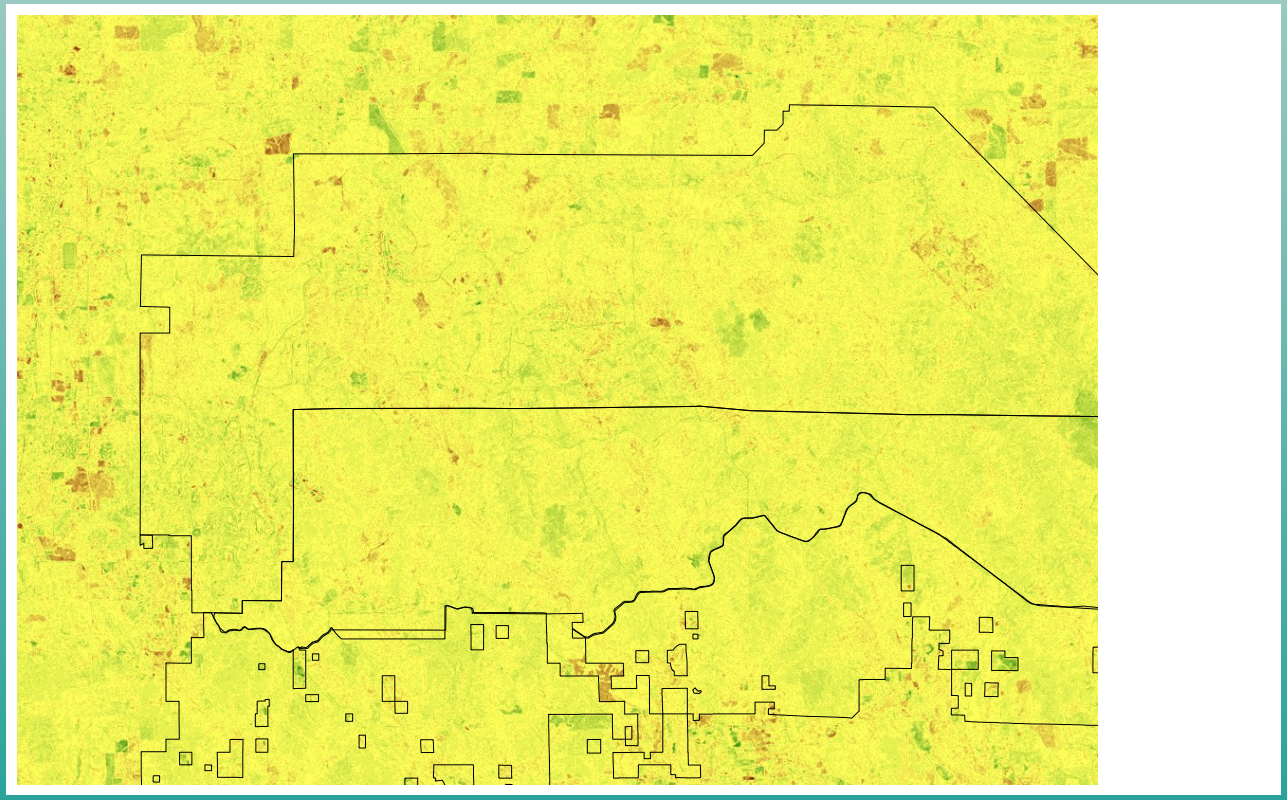


Fort Polk-KNF Biomass 2000



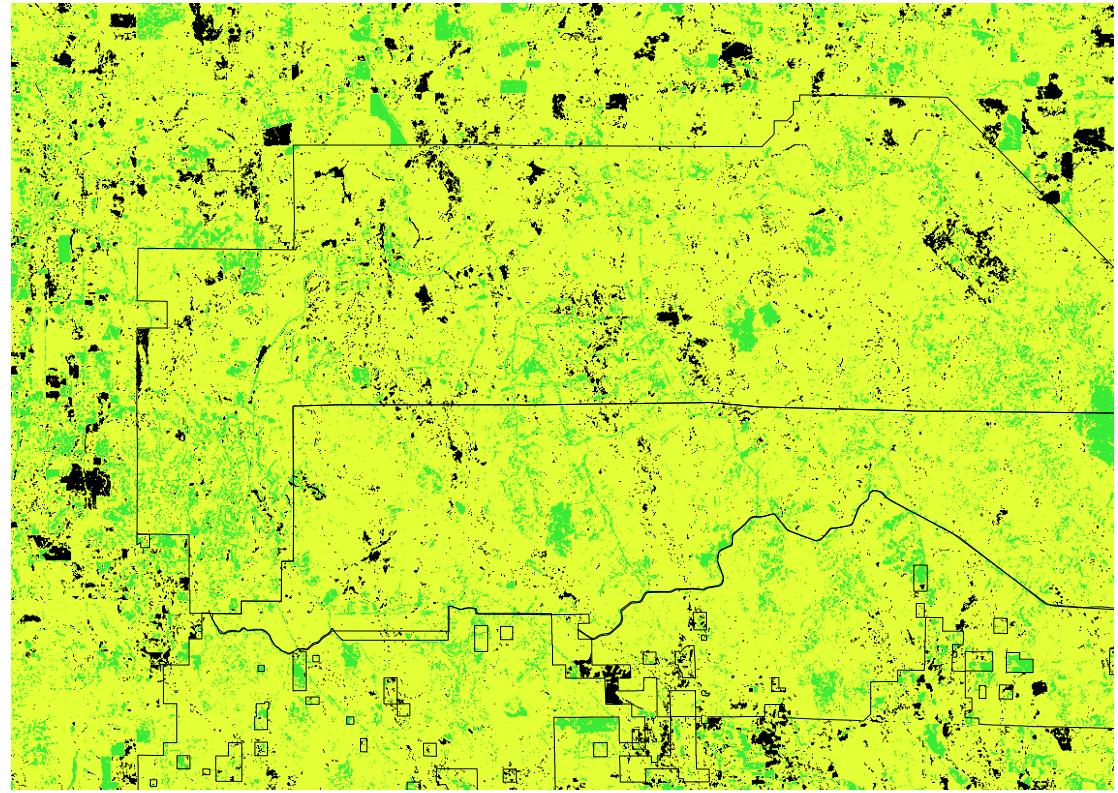
Biomass Change

Fort Polk Main Post (Army), IUA and LUA (Forest Service)

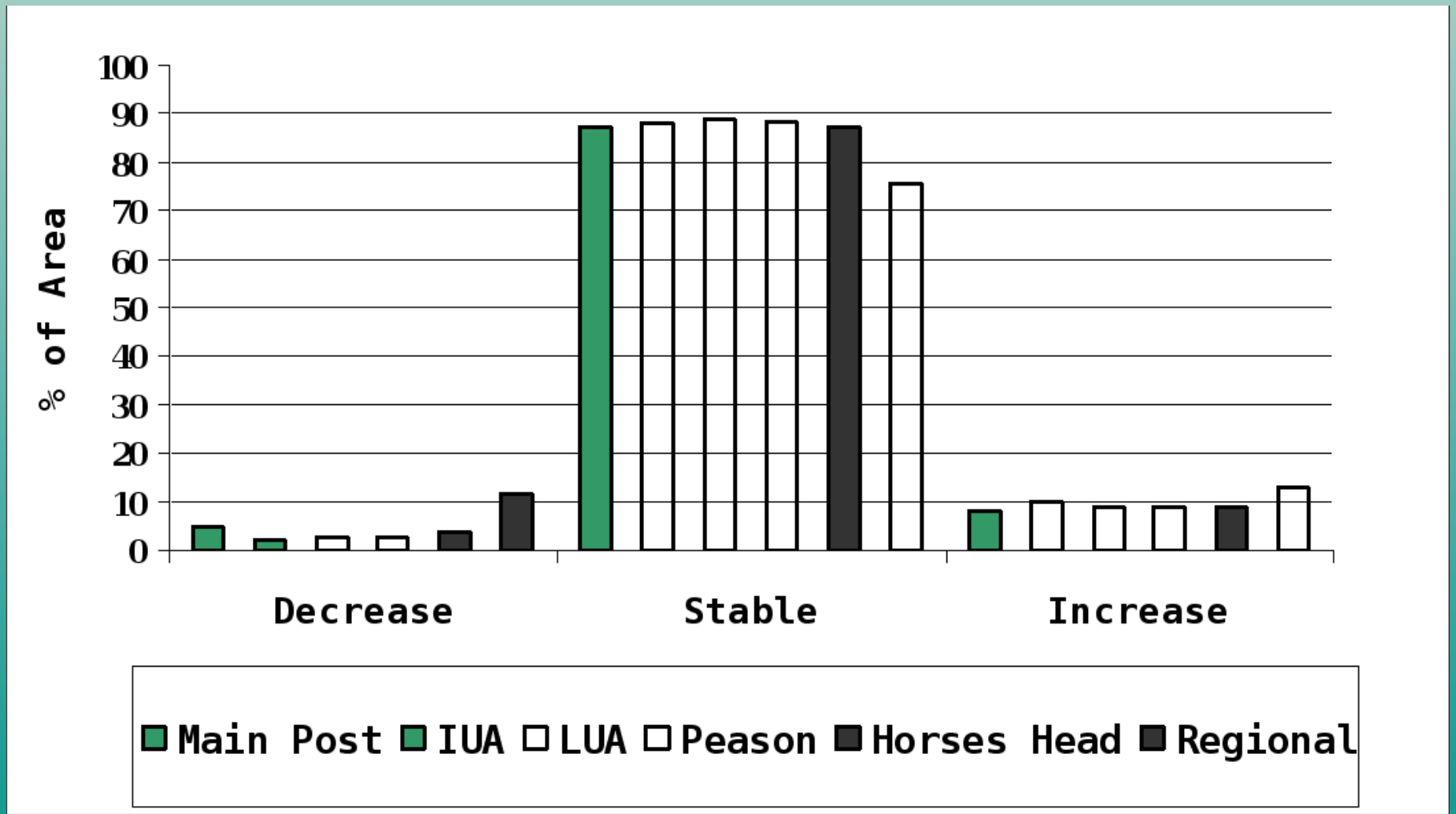


Discrete Biomass Change

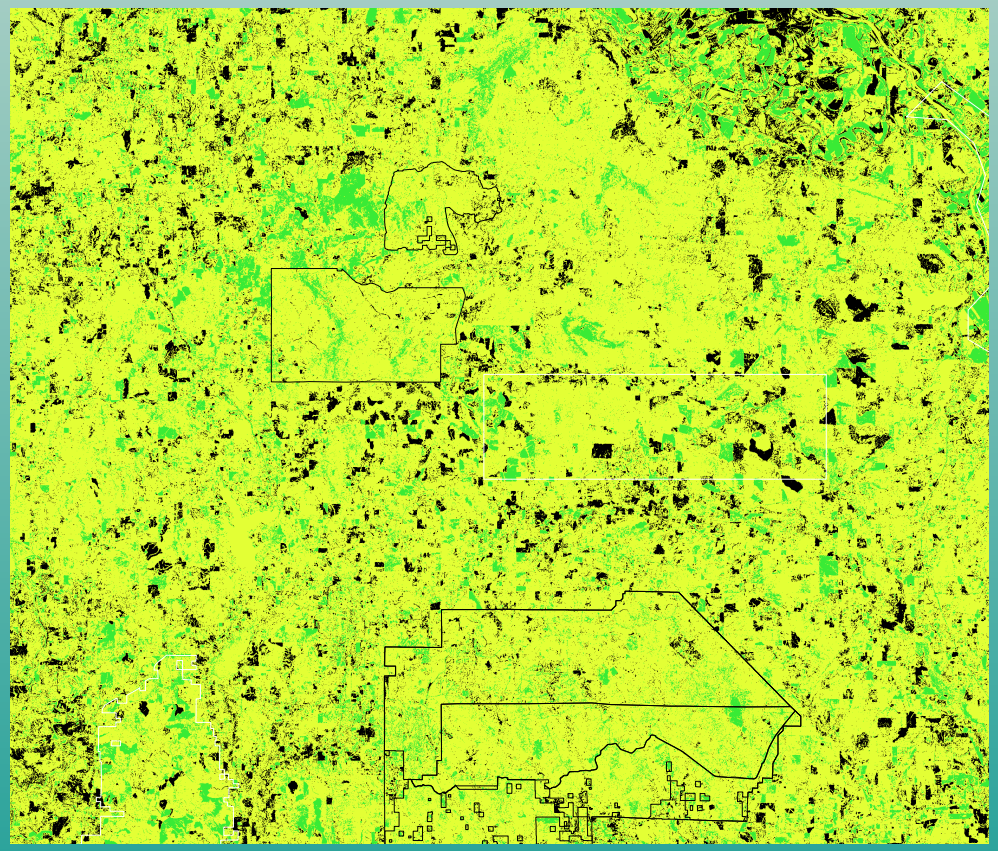
Fort Polk Main Post (Army), IUA and LUA (Forest Service)



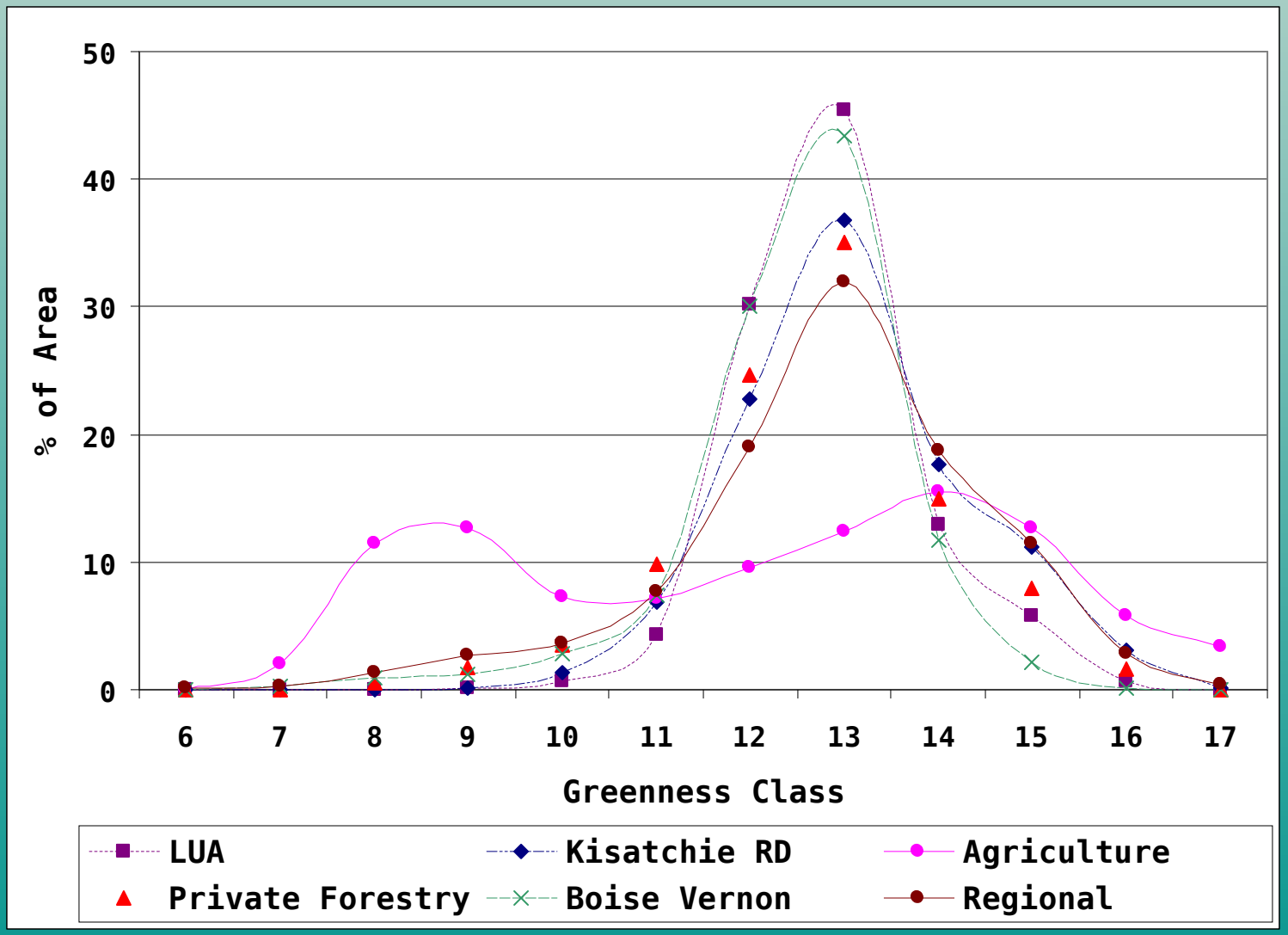
Fort Polk-KNF Biomass Change



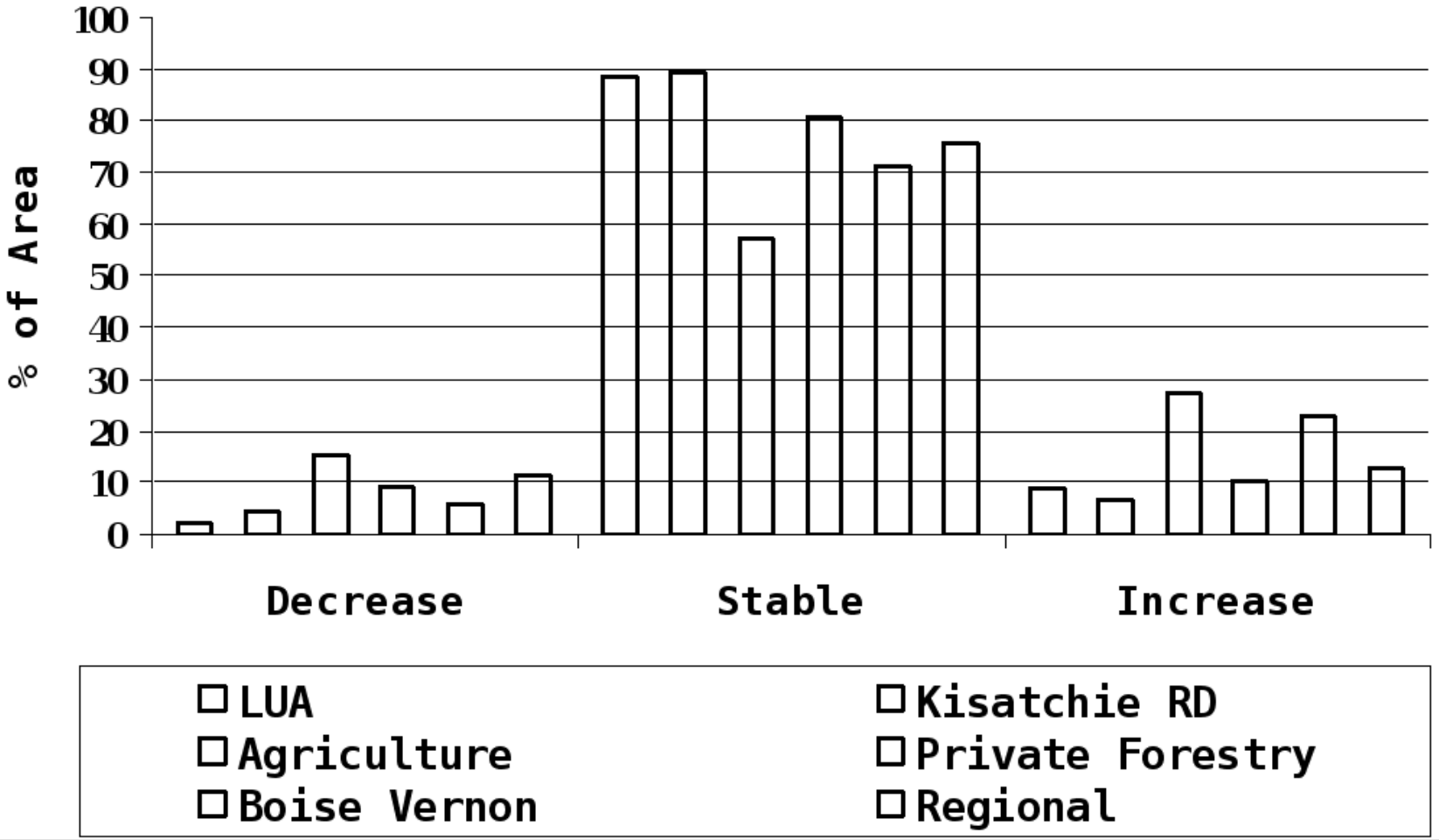
Discrete Biomass Change



Other Biomass 2000



Other Biomass Change

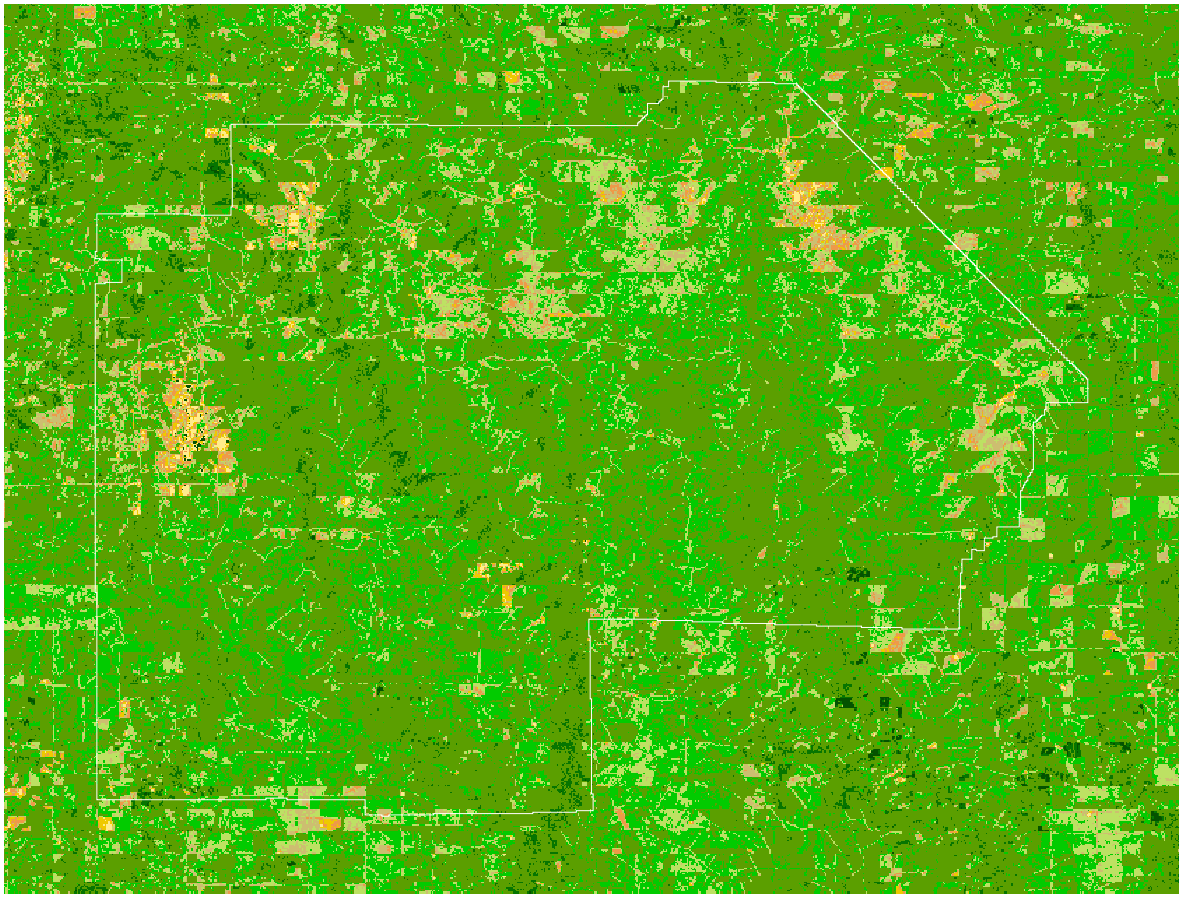


Development of C-factor

- Senseman et al. (1996) and Ehlschlaeger and Tweddale (2000) modeled the relationship between vegetative indices and LCTA plots to determine C-factor for rangelands
- Regression method superior to within-habitat type averaging methods
  - Provides estimates for under-sampled cover types/conditions
  - Captures spatial variability within cover types
  - Avoids need for vegetation cover type classification

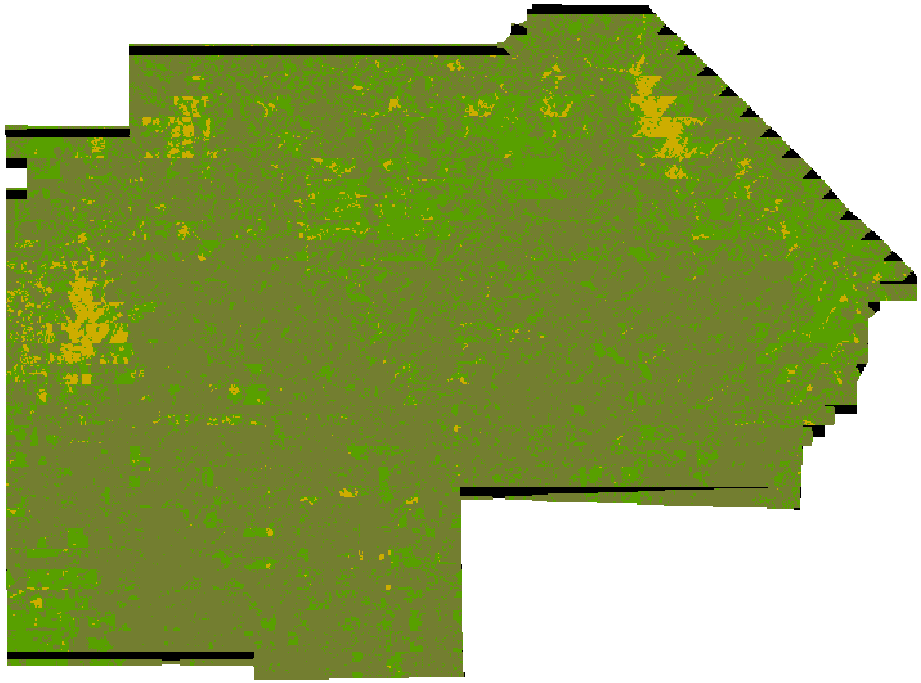
New C-factor Layer

Fort Polk Main Post (Army), IUA and LUA (Forest Service)



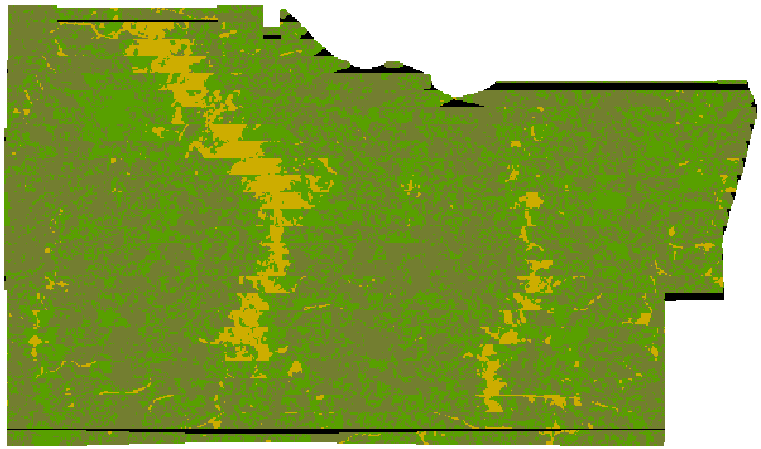
Original C-factor Layer

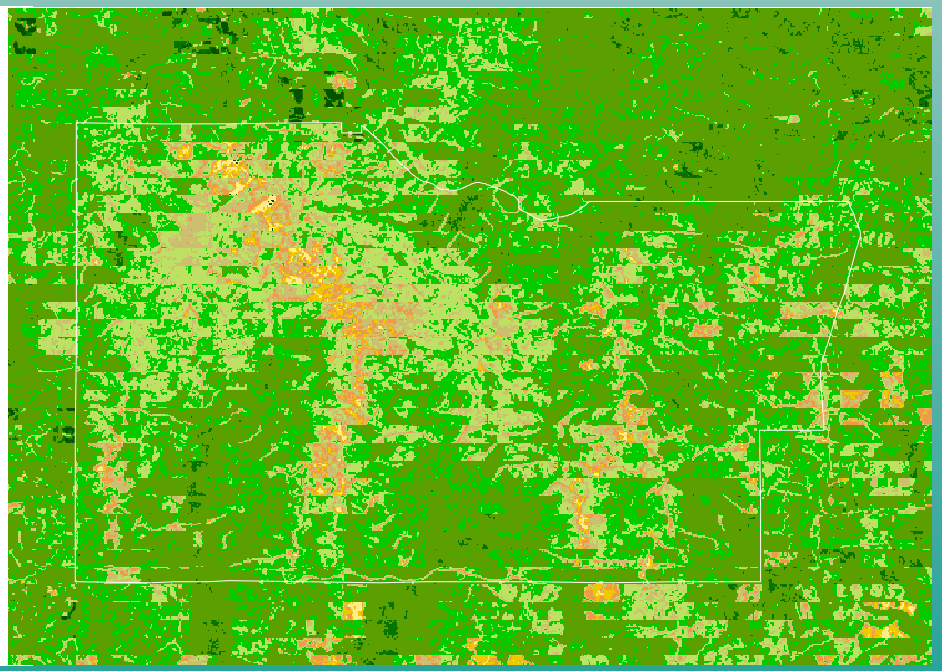
Fort Polk Main Post (Army), IUA and LUA (Forest Service)



Original and New C-Factor

Peason Ridge (Army)





Conclusions

- LCTA data provided critical field measurements of vegetative conditions
- At-satellite tasseled cap transformation provided a means to assess vegetative conditions:
  - Across administrative boundaries
  - Through time
  - Among Federal and non-federal lands
- We were able to combine LCTA observations with satellite imagery to produce C-factor estimates on a landscape scale in a forested environment
- First use of greenness to develop C-factor